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GB 1559927 A GB 1008733 A GB 0252952 A
GB 0240512 A

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(54) Liquid product dispensing device – dip tubes

(57) A pressurized dispensing device has a container formed from a body part 10, a bottom part 11, a dome-shaped top part 12 and a valve cup 13. A valve 14 is mounted on the cup 13 and an actuator 15 is mounted on valve 14. A dip-tube 17 extends downwardly from valve 14 and terminates in a free end 18. A tubular-shaped weight 20 is inserted into the free end of the dip-tube 17. The container contains a liquid product 30 and a propellant in the form of a compressed gas. When the dispensing device is used in a non-upright position, the weight 20 pulls the free end 18 of dip-tube 17 to the lowest part of the container. This ensures that the end is immersed in the product. In the preferred example the weight 20 is formed from a metal-ceramic composite comprising tungsten carbide, zirconia and nickel. This composite has a density 14 grams per cubic centimeter. By way of modification, the weight 20 may be replaced by a weight having the shape of a longitudinal rod (40) provided with a pair of external grooves (42) (Figs. 5, 6).

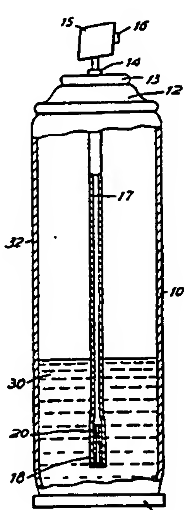

FIG. 1

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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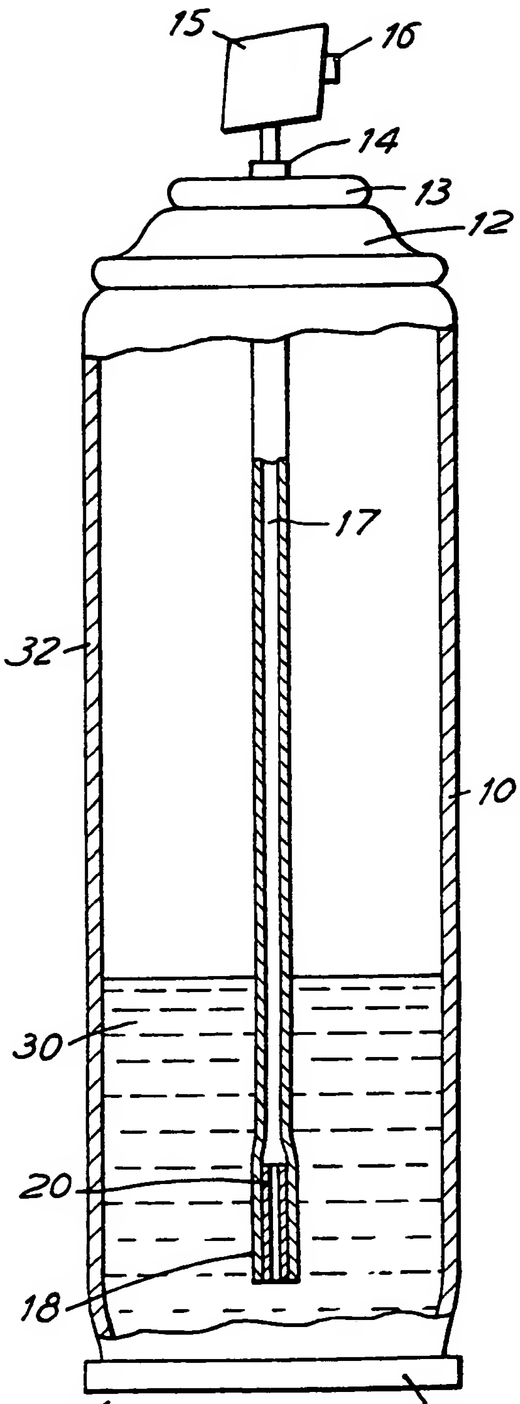

FIG. 1

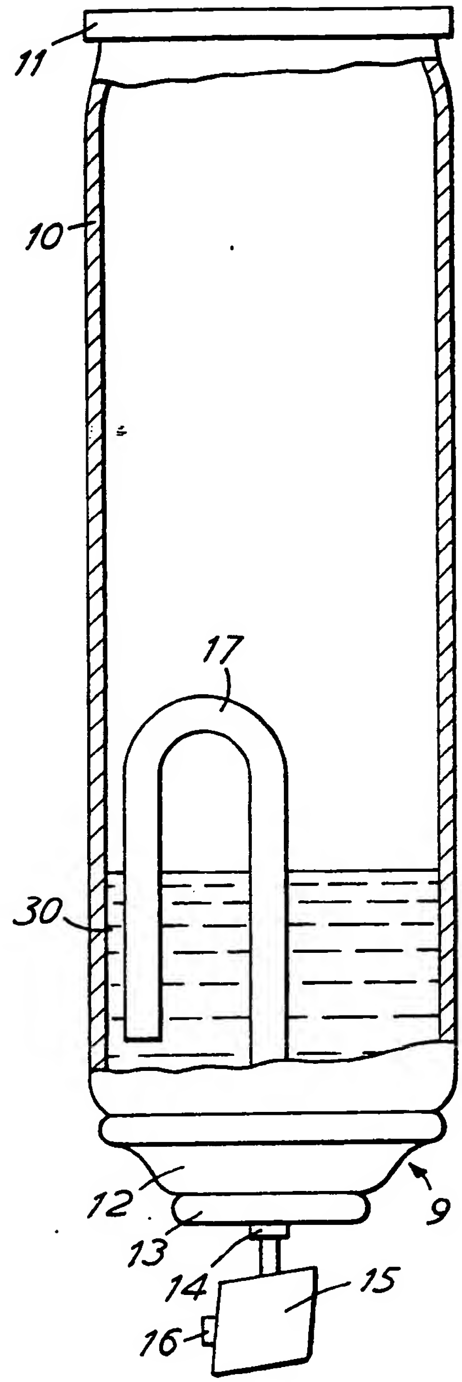

FIG. 4

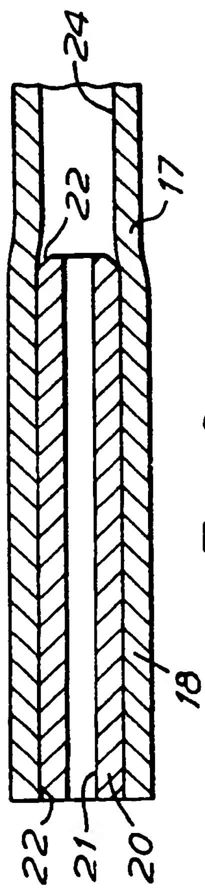

FIG. 2

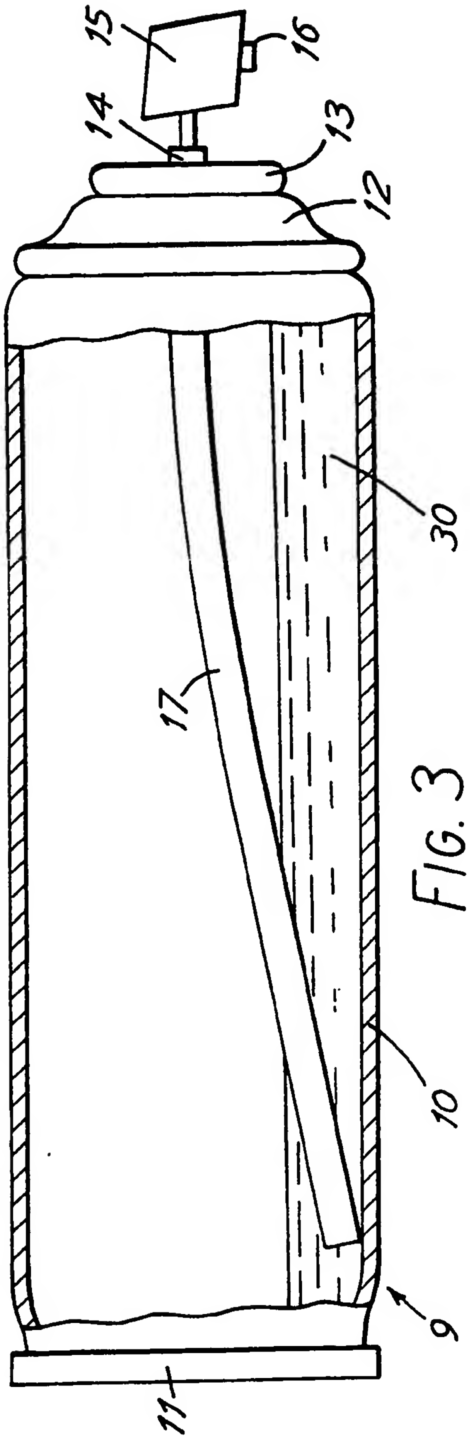

FIG. 3

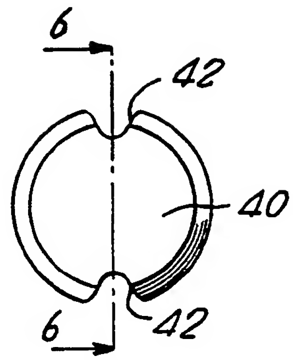

FIG.5

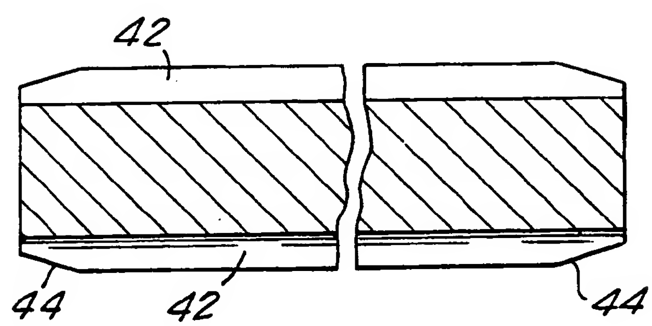

FIG.6

LIQUID PRODUCT DISPENSING DEVICE

This invention relates to a liquid product dispensing device and particularly, but not exclusively, to a liquid product dispensing device of the type comprising a container, a valve mounted on the container, an actuator for operating the valve, a liquid product to be dispensed and a propellant contained inside the container, and a dip-tube located in the container and in fluid communication with the valve.

When a dispensing device of the type set out above is in an upright position, the free end of the dip-tube is located near the bottom of the container and is surrounded by the product. If the actuator is operated with the dispensing device in an upright position, product enters the dip-tube at its free end and passes through the dip-tube, valve and actuator and is discharged through a nozzle.

When the dispensing device is in a position other than upright, the free end of the dip-tube may no longer be surrounded by the product. Consequently, if the actuator is operated with the dispensing device in a position other than upright, there is a danger that propellant and not product will enter the free end of the dip-tube, thereby causing a loss of propellant. This loss of propellant may cause the problem that there is insufficient propellant remaining in the container to dispense the remainder of the product.

In order to overcome this problem, it is known to attach a weight to the free end of the dip-tube. When the dispensing device is used in a non-upright position, the weight pulls the free end of the dip-tube to the lowest part of the container. In order to provide the weight with sufficient mass, a

relatively large weight has been used, all or most of which is located externally of the dip-tube. Consequently, when the dispensing device is shaken, the weight hits the wall of the container, thereby causing noise and possibly damage to the internal coating of the container.

It is an object of this invention to provide a new or improved liquid product dispensing device in which the above mentioned problems are overcome or reduced.

According to this invention, there is provided a liquid product dispensing device comprising a container, a head assembly mounted on the container, a liquid product to be dispensed contained inside the container, a dip-tube located inside the container and in fluid communication with the head assembly, and an elongate weight, the whole length, or substantially the whole length, of which is located inside the free end of the dip-tube, the weight having at least one longitudinally extending passage for permitting the liquid product to pass through the dip-tube, and the weight being formed from a material having a density equal to, or greater than, twelve grams per cubic centimetre.

By forming the dip-tube from a material having a density equal to, or greater than, twelve grams per cubic centimetre, a relatively small weight may be used, thus making it possible to locate the weight inside the dip-tube. Consequently, when the dispensing device is shaken, the weight does not hit the wall of the container.

This invention will now be described in more detail, by way of example, with reference to the accompanying drawings in which:

Figure 1 is an elevational view, partly in

cross-section, of a dispensing device embodying this invention in an upright position;

Figure 2 is a longitudinal sectional view of the free end of the dip-tube of the dispensing device of Figure 1 showing the location of the weight;

Figure 3 is an elevational view of the dispensing device of Figure 1 in a horizontal position;

Figure 4 is an elevational view of the dispensing device of Figure 1 in an inverted position.

Figure 5 is an end view of an alternative weight for the dispensing device of Figure 1; and

Figure 6 is a longitudinal sectional view of the weight of Figure 5 taken on the line 6-6 of Figure 5.

Referring now to Figure 1, there is shown a dispensing device 9 embodying this invention in an upright position. The dispensing device 9 comprises a container formed from a cylindrical body part 10, a bottom part 11 joined to the body part 10 by a double seam, and a dome-shaped top part 12 joined to the body part 10 by a double seam. The dispensing device 9 includes a head assembly in the form of a valve cup 13, a valve 14 and an actuator 15. The valve cup 13 is swaged to the top part 12. The valve 14 is mounted on the valve cup 13 and the actuator 15 is mounted on the upper part of the valve 14. The actuator 15 has an internal passage which communicates at one end with the outlet of the valve 14 and is terminated at its other end with a nozzle 16. A dip-tube 17 extends downwardly inside the container from the inlet of valve 14 and has a free end 18 located near the bottom of the container. A

tubular-shaped weight 20 is located inside the free end 18 of the dip-tube 17. As will be explained below, the weight 20 pulls the free end 18 of the dip-tube 17 towards the lowest part of the container when the dispensing device 9 is used in a non-upright position. The components of the container are formed from a metal, for example steel. The dip-tube 17 is formed from a rubber material, for example santoprene. The material of the weight 20 will be described below.

The weight 20 and dip-tube 17 will now be described with reference to Figure 2. In cross-section, the weight 20 has a circular external shape and its bore 21 also has a circular shape. The ends of weight 20 have chamfers 22 which are formed at 45° to the longitudinal axis. Chamfers 22 aid insertion of weight 20 into dip-tube 17. The external diameter of weight 20 is slightly greater than the normal diameter of bore 24 of dip-tube 17. Consequently, in the vicinity of weight 20, the dip-tube 17 is in a stretched condition. This stretched condition helps to ensure that the weight 20 is retained in position during use of the dispensing device. In the example shown in Figure 2, the ends of dip-tube 17 and weight 20 are in line with each other. By way of variation, the end of weight 20 may extend slightly beyond the end of dip-tube 17 or the end of the dip-tube 17 may extend slightly beyond the end of weight 20.

In the present example, the weight 20 has a length of 20 centimetres, an external diameter of 3.17 millimetres and an internal diameter of 1.0 millimetres. The weight 20 is formed from a material having a density of 14 grams per cubic centimetre and the weight 20 has a mass of 2.0 grams. The dip-tube 17 has an internal diameter of 3.0 millimetres. In

order to ensure that the dip-tube 17 is flexible, it has a thin wall.

By forming the weight 20 from a material having a relatively high density, it is possible to achieve a weight which has sufficient mass to pull the free end of the dip-tube 17 to the lowest part of the container but which can be contained inside the dip-tube 17. Because the weight 20 is contained inside the dip-tube 17, it does not hit the wall of the container when dispensing device 9 is shaken.

This container contains a liquid product 30 which is to be dispensed and a propellant in the form of a compressed gas and which occupies the space indicated by reference numeral 32. The compressed gas may be, for example, air, nitrogen or carbon dioxide. After filling, the product typically occupies two thirds of the interior of the container and the propellant has a pressure of 10 bar above atmospheric pressure.

When the dispensing device 9 is operated in the upright position shown in Figure 1, the product 30 enters the free end of dip-tube 17. It then passes through bore 21 of weight 20 and bore 24 of dip-tube 17. Thus, the bore acts as a passage for permitting the product 30 to pass through the dip-tube 17. After passage through the valve 14 and actuator 15, the product is discharged through nozzle 16.

Although dispensing device 9 will normally be operated in an upright position, such a dispensing device may sometimes be operated in a non-horizontal position. The operation of the dispensing device 9 in horizontal and inverted positions will now be described with reference, respectively, to Figures 3 and 4. For simplicity, in these figures the dip-tube

17 is shown not in cross-section.

Referring now to Figure 3, when the dispensing device 9 is used in a horizontal position, the weight 20 pulls down the free end of the dip-tube 17 so that it engages the wall of the container. Referring now to Figure 4, when the dispensing device 9 is used in an inverted position, the weight 20 pulls the end of dip-tube 17 into engagement with the top part 12. Consequently, in both the horizontal and inverted positions, the free-end of the dip-tube will be immersed in the product. Such immersion will occur even when there is only a small amount of product remaining in the container.

In the example described above, the dip-tube 17 must be sufficiently flexible to let it assume the shape shown in Figure 4. If the dispensing device is not required to operate in an inverted position, the dip-tube need only bend to the extent shown in Figure 3 and a less flexible dip-tube may be used.

Although in the example described above the propellant is a compressed gas, the weight 20 may be used in a dispensing device which uses a liquified gas, for example butane, as a propellant.

Referring now to Figures 5 and 6, there is shown an alternative weight 40 which may be inserted into the dip-tube 17 in place of the weight 20. The weight 40 is formed as an elongate cylindrical rod which has a pair of longitudinally extending grooves 42 formed in its cylindrical surface. In use, each of the grooves 42 acts as a passage for permitting the product 30 to pass through the dip-tube 17. The ends of weight 40 have chamfers 44. The weight 40 has a density of 14 grams per cubic centimetre.

A suitable material for the weight 20 or

the weight 40 will now be described.

The material of weight 20 or weight 40 may be a metal-ceramic composite comprising tungsten carbide, nickel, and zirconia. In the preferred composition, the metal-ceramic composite comprises 84.5 to 87.5% tungsten-carbide, 12 to 14% zirconia and 0.5 to 1.5% nickel, each by weight. With this composition, the material has a density of 14 grams per cubic centimetre. This composition provides a material which is non-magnetic and has excellent wear resistance and hot hardness properties. In the weight 20 or the weight 40, the metal-ceramic composite material is provided with a protective coating of titanium nitride or silicon carbide.

The process for making weights 20 or weights 40 from a material having the composition set out above will now be described.

Each of the components of the metal-ceramics composite is reduced, individually, to a powder in a ball mill. More specifically, the tungsten carbide, zirconia and nickel are reduced to particles having diameters which, respectively, are less than 3 micrometres, 40 micrometres and 2 micrometres. Each powder is dispersed in acetone and subjected to a spray drying operation. The three powders are then blended together and mixed with paraffin wax which acts as a binder.

The resulting mixture is compacted and extruded to form a tube for weights 20 or a grooved rod for weights 40. The tube or rod is cut into lengths to form workpieces, each of which has dimensions corresponding to those of weight 20 or weight 40. The workpieces are heated in a presintering furnace at 600°C to remove the paraffin wax. Then, the workpieces are heated in a sintering

furnace at 1462°C. Finally, the workpieces are provided with a protective coating of titanium nitride or silicon carbide by vapour deposition.

Although the material described above represents the preferred material for the weight 20 or the weight 40, other materials are also suitable. By way of alternative, in the metal-ceramic composite described above, the zirconia may be replaced by titanium diboride. By way of another alternative, in the metal ceramic composite described above, copper may be substituted for nickel. The substitution of copper for nickel results in a material having a density of only 12 grams per cubic centimetre. However, even with a density of only 12 grams per cubic centimetre, it is still possible to achieve a weight having sufficient mass to bend the dip-tube as described above.

Suitable materials for the weight 20 or the weight 40 are not limited to metal-ceramic composites. For example, the weight 20 may also be formed from a tungsten-copper alloy. The weight 20 may also be formed from pure tungsten. However, pure tungsten suffers from the disadvantage that it cannot easily be formed to a particular shape.

By way of another example, the weight 20 or the weight 40 may be formed as a composite comprising tungsten-carbide and cobalt. In this composite, the tungsten-carbide is bonded together by the cobalt to form a matrix. When forming the weight 20 or the weight 40 from this composite, it may provided with a protective coating of titanium carbide or titanium nitride.

In the example described above, the dip-tube 17 and the weight 20 or the weight 40 form part of a dispensing device of the type which has a head

assembly in the form of a valve and a valve actuator. However, the dip-tube 17 and weight 20 or weight 40 may also be used in a dispensing device of the pump-operated type. In a dispensing device of the pump-operated type, the head assembly comprises a pump and a lever for operating the pump, and no propellant is provided.

CLAIMS

1. A liquid product dispensing device comprising a container, a head assembly mounted on the container, a liquid product to be dispensed contained inside the container, a dip-tube located inside the container and in fluid communication with the head assembly, and an elongate weight, the whole length, or substantially the whole length, of which is located inside the free end of the dip-tube, the weight having at least one longitudinally extending passage for permitting the liquid product to pass through the dip-tube, and the weight being formed from a material having a density equal to, or greater than, twelve grams per cubic centimetre.

2. A dispensing device as claimed in Claim 1, in which the weight is tubular-shaped.

3. A dispensing device as claimed in Claim 1, in which the weight has at least one longitudinally extending external groove, the or each groove acting as a passage for permitting fluid to pass through the dip-tube.

4. A dispensing device as claimed in any one of the preceding claims, in which the weight is formed from a material which consists of, or includes, tungsten either as a free metal or a compound.

5. A dispensing device as claimed in any one of the preceding claims, in which the weight is formed from a metal-ceramic composite comprising tungsten carbide, a metal selected from a group consisting of nickel and copper, and a ceramic selected from a group consisting of zirconia and titanium diboride.

6. A dispensing device is claimed in Claim 5, in which the weight is formed from a metal-ceramic

composite comprising tungsten carbide, nickel and zirconia.

7. A dispensing device as claimed in any one of Claims 1 to 3, in which the weight is formed as a composite comprising tungsten-carbide and cobalt.

8. A dispensing device as claimed in any one of Claims 1 to 7, in which the weight is provided with a protective coating.

9. A dispensing device is claimed in any one of the preceding claims, in which the head assembly comprises a valve mounted on the container and an actuator for operating the valve, and which includes a propellant contained in the container.

10. A dispensing device as claimed in Claim 9, in which the propellant is a compressed gas.

11. A liquid product dispensing device substantially as hereinbefore described with reference to Figures 1 to 4, or Figures 1 to 4 as modified by Figures 5 and 6, of the accompanying drawings.

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